



Professional Engineers
Ontario



PRACTICE STANDARD

ENGINEERING INSPECTION FOR TOWER CRANES

as required by Ontario Regulation 213/91 under the *Occupational Health and Safety Act*.

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Engineering Inspection Practice Standard for Tower Cranes as Required by Ontario Regulation 213/91 under the *Occupational Health and Safety Act*

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1. Purpose and Scope of Practice Standard

This Practice Standard updates and prescribes the responsibilities for professional engineers, limited licence holders and those persons directed by them in inspecting tower cranes as required by sections 158, 159 and 165 of Ontario Regulation 213/91 (O. Reg. 213/91) under the [*Occupational Health and Safety Act*](#) and referenced in Ontario Regulation 260/08 (Performance Standards) made under the *Professional Engineers Act*.

The primary purpose of the required inspections is to ensure that a tower crane can safely be put into service or to continue service. Sections 158, 159 and subsection 165(3) of O. Reg. 213/91 require professional engineers, limited licence holders and those persons directed by them to perform inspections and to document that all inspections specified under subsections 158(3), 159(2) and 165(3) have been completed in accordance with the PEO Performance Standard in Part IV of O. Reg. 260/08, and to confirm that specified components are in adequate condition.

The specific objectives of this Practice Standard are to:

1. Describe the standard of practice for professional engineers, limited licence holders or other persons directed by them when performing Tower Crane inspections, and confirming that all components are in adequate condition, in accordance with ss. 158 (3) and 159 (2) of Ontario Regulation 213/91.

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2. Specify the tasks and services that engineers must complete to meet the appropriate standard of practice and to fulfill their professional obligations under the *Professional Engineers Act*. These obligations include the engineer's primary duty to protect the safety, health and welfare of the public and the environment.

3. Describe the engineer's skill sets and competencies that are consistent with the training and experience required to carry out these professional activities.

Note: This document should be read in conjunction with Ontario Regulation 213/91: Construction Projects

1.1 Definitions for terms used in this Practice Standard

Note: Unless noted below, all terms used in this Practice Standard have the same meaning as given in subsection 1(1) of Ontario Regulation 213/91 or section 1 of the *Occupational Health and Safety Act*.

"client" means the person or entity that has retained the services of the engineer. Examples of clients may include:

- equipment operators (tower crane owner or entity leasing the equipment); or
- third-party maintenance facilities (who perform the preventive maintenance tasks).

"demarcation point" means the point at which the electricity provider's distribution system ends at the customer's transformer or disconnect switch.

"electrical component" means any component that is used as part of the electrical system of a tower crane.

"equipment operator" means the entity that operates the equipment. This could be the tower crane owner or a separate entity leasing the equipment.

"load test" means a process of putting weight on the load block or hook to verify a tower crane's ability to operate at its designated maximum operating capacity, as specified by the original equipment manufacturer or an engineer.

"mechanical component" means any component that is used as part of the mechanical system for a tower crane.

"modification" means any change, repair or replacement that results in a deviation from the original specifications provided by the original equipment manufacturer.

"original equipment manufacturer" ("OEM") means the company or commercial entity that originally manufactured the equipment, or the entity that assembled the equipment from multiple original equipment manufacturers to sell under its own brand name.

"qualified electrician" means a person holding a valid certificate of qualification for "Electrician – construction and maintenance" issued under the *Ontario College of Trades and Apprenticeships Act, 2009*.

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“qualified NDT technician” means a person certified by Natural Resources Canada to the appropriate level in accordance with the version of the CAN/CGSB Standard 48.9712-2014, Non-destructive Testing — Qualification and Certification of Personnel, as it may be amended from time to time and that was in effect at the time of certification, and whose certification is valid at the time the test is carried out and interpreted.

“qualified technician” means a person qualified as competent by a tower crane owner, client, operator or original equipment manufacturer through their training and experience to perform the work on specific components of a tower crane; and who carries out such work on an ongoing basis for a tower crane owner or the original equipment manufacturer.

“structural component” means any load-bearing or load-transferring components of the equipment.

“structural repair” means any modification, alteration or addition required to restore a damaged structural component to its original or rated capacity.

2. Inspection Requirements of the Standard

The inspection of a tower crane may involve completing one or more inspection processes described separately in Part A, Part B, Part C, Part D or Part E, which follows. The sequence is based on the structure of sections 158, 159 and 165 of O. Reg. 213/91.

Note: Reference to the singular (for example, “engineer” or “person directed by the engineer”) includes reference to the plural and vice versa or “he/she” or “they”, are taken as interchangeable and therefore as referring to same.

A standardized inspection report format should be implemented for the initial, periodic and annual inspections to enable consistency across different assessments, making it easier to track over time. When an engineer obtains a report in the course of performing the inspection requirements contained in the Parts below, and reviews the report’s contents, the engineer shall determine whether the report meets the requirements of the Practice Standard, CSA Standard Z248-17 or OEM specifications and shall prepare a compliance report summarizing the findings.

The findings shall be presented to the tower crane owner in a clear, logical format that identifies any deficiencies in reports or findings that require immediate action as soon as possible. Inspections shall only continue after the tower crane owner corrects the identified deficiencies.

2.1 Part A: Inspection Requirements Prior to Use

Note: This Part refers to tower cranes **other than** self-erecting ones, which are addressed in Part D below, and rail-mounted tower cranes, which are addressed in Part E.

The following are prescribed as the Practice Standard with respect to inspection of a tower crane as provided for in subparagraphs 1i. and ii. of s.158(1) of O. Reg. 213/91 under the *Occupational Health and Safety Act* by an engineer or by person(s) directed by the engineer.

Inspections of a tower crane must be conducted:

- a) before the tower crane is erected at a project,
- b) after the tower crane is erected and before it is used, and
- c) thereafter at intervals not greater than 12 months or as often as is recommended by the tower crane's original equipment manufacturer, whichever is more frequent, while the tower crane is erected at a project. (**Note:** this is addressed in Part B)

Pre-Inspection Review of Tower Cranes Prior to Erection

Documentation Review

(1) Before conducting an on-site review of a tower crane, the engineer shall:

(a) request the tower crane owner, operator or client to make available to the engineer: foundation, shoring and bracing design drawings (s.157 of O. Reg 213/91), all available technical information, full manuals, original equipment manufacturer recalls, tower crane logs (s.152), previous pre-erection and post-erection reports, records of previous non-destructive testing, original equipment manufacturer's recommendations for inspections, repairs and replacement of components as requested in ss.158(1), maintenance records, previous daily, weekly and monthly inspections performed under s.161.1, operational test results performed under ss.161(1), parts replacement records and details of any structural repairs, any non-routine maintenance, and all records of modifications for the tower crane to be reviewed that provides information for each major component or sub assembly, including, but not limited to, the following:

- (i) tower crane original equipment manufacturer, model and serial numbers;
- (ii) unique marks for each component;
- (iii) basic dimensional information to aid identification of components;
- (iv) height under hook;
- (v) reeving specifications;
- (vi) tower height (type and number of sections);
- (vii) boom length (type and number of sections);
- (viii) anchor bolt specifications;

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- (ix) counterweight specifications, including arrangement and weight of each counterweight;
 - (x) central base ballast weight specifications, including arrangement, dimensions and weight of each ballast component, if applicable;
 - (xi) travelling base and track bed, if applicable;
 - (xii) foundation, shoring and bracing design drawings;
 - (xiii) building or structure tie-ins;
 - (xiv) electrical wiring diagram, including control circuits, electronic schematics, transformer specifications, and electric motor specifications;
 - (xv) power supply or generator specifications;
 - (xvi) hydraulic schematics and manuals;
 - (xvii) original equipment manufacturer's or engineer's welding procedure specifications;
 - (xviii) software verification documentation, if available;
 - (xix) documentation of all modifications;
 - (xx) load test criteria;
 - (xxi) record of the original equipment manufacturer, mark of the original equipment manufacturer and technical specifications of the tower crane anchorages, anchor bolts and nuts;
 - (xxii) slew ring bolt specifications, performance specifications on slew ring, torque requirements and bolt maintenance history;
 - (xxiii) wire rope certifications and wire rope termination proof tests results;
 - (xxiv) all the mechanical and electrical repair records; and
 - (xxv) hook block specification and maintenance record.
- (b) ensure that the information provided under (a) is sufficiently detailed to enable the engineer to confirm that the specified components have been assembled correctly;
- (c) verify that the components made available for inspection are those identified in the information provided in (a);
- (d) verify that, according to the tower crane log, the tower crane operator has, at a minimum, carried out equipment maintenance according to a pre-existing schedule;
- (e) request the tower crane owner, operator or client to provide all wire rope documentation and verify that the ropes conform to the tower crane manufacturer's specifications or specifications prepared by an engineer; and

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(f) request the tower crane owner, operator or client to provide all recall notices and technical bulletins from the original equipment manufacturer of the tower crane being reviewed; and verify from the tower crane log book that all recalls and warranty matters for the tower crane have been dealt with.

Defects

(2) Where a previous review report has identified defects requiring repair, the engineer shall obtain evidence that the necessary remedial action has been taken before a new pre-erection review is completed.

(3) If there is no evidence or record that defects have been repaired, the engineer shall immediately inform the tower crane owner of the outstanding repairs.

(4) Upon receiving notice from the tower crane owner that repairs have been completed, the engineer must either:

- (a) carry out all inspections or tests needed to verify defects have been corrected; or
- (b) provide updated instructions to directed personnel for the inspections.

Pre-Erection Inspections

Examinations and Tests

(5) The engineer shall select appropriate non-destructive test methods from the approved methods and shall provide this information to the qualified NDT technician or firm carrying out these tests.

(6) The engineer, if certified to CAN/CGSB 48.9712-2014 or an amended version of this standard that was in effect at the time of certification shall perform, or direct a qualified NDT technician to perform, visual examination and non-destructive test of each of the following components:

- (a) tower fasteners;
- (b) apex fasteners;
- (c) boom fasteners;
- (d) bridle fasteners;
- (e) pendant fasteners;
- (f) turntable-to-tower fasteners;
- (g) counterweight jib;
- (h) reusable foundation anchor bolts;
- (i) counterweight suspension points;
- (j) boom/jib;

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- (k) counter jib;
- (l) tower sections;
- (m) apex;
- (n) pendant line or bars;
- (o) travelling base;
- (p) trolley;
- (q) hook block; and
- (r) turntable.

(7) The engineer, if certified to CAN/CGSB 48.9712-2014 or an amended version of this standard that was in effect at the time of certification, shall perform or direct a qualified NDT technician to perform a complete visual examination and non-destructive test of a representative sample of the following components as accessible, including, but not limited to, the following:

- (a) access platforms;
- (b) stairways;
- (c) ladders;
- (d) signs and sign connections;
- (e) tower crane cabin connection; and
- (f) guardrails.

(8) The engineer shall request additional non-destructive testing or dismantling and inspection of any other tower crane component, if justified on the basis of:

- (a) the content of the previous inspections; or
- (b) the result of a visual examination.

(9) The engineer shall require the technician who carries out the tests described in subsections (6), (7) and (8) to provide evidence of certification to CAN/CGSB 48.9712-2014 or an amended version of this standard that was in effect at the time of certification.

(10) The engineer shall request, obtain and review the reports of non-destructive testing detailed in subsections (6) and (7) and shall confirm that the report includes:

- (a) date and location where the tests were conducted;
- (b) name, qualifications and position of the person conducting the tests;
- (c) description, serial number or identifying mark of the components examined;
- (d) details of the test method employed and reference to appropriate standards;

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- (e) calibration details of any test equipment used; and
- (f) results of the examination.

Inspections

(11) The engineer shall verify that the person(s) they direct to perform any inspections in subsections (12) through (17) are qualified to perform the inspections and shall obtain copies of the person's credentials including the name, qualifications and employing organization of the person completing the inspection and tests.

(12) The engineer or qualified NDT technician directed by the engineer shall inspect pin holes for roundness and excessive wear.

(13) The engineer or qualified NDT technician directed by the engineer shall verify that all pin retainers are in good condition.

(14) The engineer shall request and obtain a report from the master electrician, qualified electrician or qualified technician who has reviewed the electrical schematic drawings to visually inspect panels, operator controls and power wiring for compliance with the original equipment manufacturer's specifications, local standards and the Electrical Safety Authority SPEC-009 R0, Electrical Safety for Tower Cranes, and to confirm that all electrical components have been approved by a recognized authority.

(15) In assessing the slew ring, the engineer shall:

- (a) obtain the serial number or unique identifying mark of the slew ring;
- (b) observe the condition of the gear teeth on bearing and pinion; or alternatively, review the report of a qualified NDT technician or a qualified technician;
- (c) observe the condition of the slew ring greasing systems, including the condition of the grease, grease lines, nipples and lip seals; or alternatively, review the report of a qualified NDT technician or a qualified technician;
- (d) verify the torque of bolts by a qualified technician is done according to the original equipment manufacturer's specifications;
- (e) verify that bolts needing replacement as a result of the pre-erection review comply with the original equipment manufacturer's specifications or engineer's direction; and
- (f) verify that the bearing clearance and backlash of the slew ring, when loaded in its most critical orientation, is within limits set by the original equipment manufacturer.

(16) The engineer shall request and obtain a report from a qualified technician who has inspected the brake system, gear box, hook block and the hydraulic system (including pumps and motors); and shall report any improper or inadequate connections, corroded elements, leaks, hose wear and other deficiencies. The engineer shall review this report, confirm whether it complies with the requirements in this Practice Standard, CSA Standard Z248-17 and OEM specifications, and inform the owner about any deficiencies.

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(17) The engineer or qualified NDT technician shall inspect wire ropes and end terminations as per CSA Standard Z248-17.

(18) The results of the examination of wire ropes described in subsection (17) shall be included in the pre-erection inspection written report.

Pre-Erection Inspection Written Report

(19) The engineer shall prepare a written pre-erection inspection report that includes:

- (a) date and location where the examinations were completed;
- (b) record of observations made by all personnel involved in subsections (12) through (16);
- (c) the non-destructive testing report, including the name, qualifications and employing organization of the person completing the inspection and tests, and parts tested along with results; and
- (d) a statement that the tower crane parts comply with the requirements of this Practice Standard, CSA Standard Z248-17 and OEM specifications.

(20) The engineer shall immediately notify the tower crane owner in writing of any defects found during the inspection of the tower crane.

(21) The engineer shall verify that all defects have been corrected before the tower crane is erected and provide a report.

Post-Erection Inspections

Inspection of Tower Cranes During Erection, But Prior to Operation

Structural Components

(22) For tower crane components where the pre-erection inspection was completed at location(s) other than the construction site, following delivery of the tower crane components to the site and before the tower crane is erected, the engineer shall inspect any items identified by the tower crane owner, erector or contractor as having been damaged, and provide instructions for dealing with this damage and provide a report.

(23) The engineer shall verify that the components are the same ones inspected during the pre-erection inspection.

(24) The engineer shall request and obtain from the tower crane owner, client or operator the pre-erection inspection report as prepared by that engineer and confirm that the information remains valid and that any instructions have been followed. The engineer shall review this report and confirm whether it complies with the requirements in this Practice Standard, CSA Standard Z248-17 and OEM specifications, and inform the owner about any deficiencies.

(25) The engineer shall request and obtain a report from the tower crane owner, client or operator prepared by the erector and confirm that the installed configuration and counterweights conform to

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the installation design drawings prepared by an engineer or the original equipment manufacturer. If they do not conform, the engineer shall notify the tower crane owner.

(26) The engineer shall request and obtain a report from the tower crane owner, client or operator prepared by the erector confirming that, if tower sections are bolted together, tower bolts have been preloaded to the OEM-specified torque. The engineer shall confirm that the tower bolt preload report includes the following information:

- (a) date the work was completed;
- (b) the name of the person preparing the report;
- (c) details of the equipment used, including the serial numbers or identifying marks;
- (d) calibration details for the equipment used;
- (e) settings used on the torque or stretching device; and
- (f) the applied torque and original equipment manufacturer's specifications.

(27) The engineer shall provide the tower crane owner's instructions for dealing with any damage in subsection (22), incorrect installation noted in subsections (25) or (26), or missing information required in the report under subsection (26).

(28) The engineer shall ensure that swivel on any rope is installed in accordance with the tower crane original equipment manufacturer's specifications.

(29) Following erection, the engineer, or qualified NDT technician directed by the engineer, shall climb the tower crane and visually inspect structural components of the tower crane that are accessible from access platforms and guardrails, which were examined by non-destructive testing during the pre-erection review. The purpose of the inspection is to confirm that the components have not been damaged during erection of the tower crane.

(30) The engineer shall request and obtain a report from the tower crane owner, client or operator prepared by the erector, confirming that the following components have been properly installed:

- (a) all parts of the tower crane structure;
- (b) ladders, landings, guardrails and access walkways;
- (c) pins and pin retainers;
- (d) bolt head and nut locking means, if specified by the original equipment manufacturer;
- (e) counterweights; and
- (f) tower crane supports shown on the installation drawing (including, but not limited to, shoring, bracing and tie-ins).

(31) The engineer shall confirm that the tower crane has been installed in accordance with the installation configuration drawing in accordance with the requirements of s.157 of O. Reg. 213/91.

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(a) for a fixed tower crane installation, the engineer shall confirm that the foundation and tower crane supports shown on the drawing, including, but not limited to, shoring, bracing and tie-ins, have been designed and inspected by an engineer.

(b) for a tower crane installed on a travelling base, the engineer shall confirm that the foundation, rail bed, rails and tower crane base support shown on the drawing have been designed and inspected by an engineer in accordance with Part E of this standard.

(32) The post-erection report shall identify any deficiencies in the structural components of the tower crane and the engineer shall verify these components have been repaired to their original equipment manufacturer's specifications or engineer's instructions prior to submitting the final report.

Electrical Components

(33) The engineer shall request and obtain a report from the tower crane owner, client or operator who provided inspection findings from a qualified electrician who has carried out a grounding continuity test for both the tower crane and power supply grounding systems, and confirm that the report contains the following in accordance with the Electrical Safety Code:

(a) the name, qualifications and employing organization of the person completing the test;

(b) results of the test;

(c) comparison of the test results with standard requirements;

(d) identification and calibration details of the test equipment used; and

(e) the date the test was completed.

(34) The engineer shall request and obtain, prior to the tower crane being put into service, a report provided by the tower crane owner, client or operator of any repairs to electrical components or tests done to the tower crane since the last time the tower crane was in operation. The engineer shall confirm that the report contains:

(a) the name, qualifications and employing organization of the person completing the inspection and tests;

(b) results of the inspection and tests;

(c) comparison of the test results with the original equipment manufacturer's specifications; and

(d) the date the inspection and tests were completed.

(35) The engineer shall request and obtain a report from a qualified electrician, a master electrician or a qualified technician and confirm that the report contains the following:

(a) the qualifications of all inspection personnel performing these inspections to the engineer for verification;

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- (b) verification of the demarcation point with the local power authority or general contractor;
- (c) visual inspection of the entire electrical system from the demarcation point or generator to the electrical components on the tower crane, looking for damage or violations of the Electrical Safety Code and compliance with the original equipment manufacturer's specifications;
- (d) verification that the electrical system was powered up and all operating electrical components checked for vibration and excessive heat, and verification that the components are functioning as intended;
- (e) verification that the electrical equipment and its components are appropriate for the environment in which it will be operating;
- (f) verification that each in-use limit switch, overload limit device, and any other limiting device specified by the original equipment manufacturer, was properly located, set and operating as intended;
- (g) verification that emergency stops functioned as intended;
- (h) verification that the tower crane structure was grounded separately from the power system via grounding rods, plates or other means of distributing charge to the earth;
- (i) verification, if power is supplied by a generator, that the generator was separately grounded in accordance with the Electrical Safety Code and the original equipment manufacturer's instructions;
- (j) visual check of the control wiring and report damage or improper installation;
- k) visual check of the condition of electronic components; and
- (l) a statement that the tower crane electrical system complies with the requirements of this Practice Standard, CSA Standard Z248-17, OEM specifications, and local legislation, and there is no outstanding electrical issue with the tower crane.

Mechanical Components

- (36) The engineer shall request and obtain a report from a qualified technician and confirm that the report contains the following:
- (a) the qualifications of all inspection personnel performing these inspections to the engineer for verification;
 - (b) confirmation that all control levers operate the appropriate function, move smoothly, return to neutral position when released, and are properly identified;
 - (c) verification that calibration of the load moment system (load indicator, angle indicator, height indicator, radius indicator) has been completed;

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- (d) check of the functioning, integrity and condition of limit switches and operator's controls;
- (e) witnessing of the functional tests for all control components at the extreme limits of use, as described by the original equipment manufacturer or in the most unfavourable position determined by the engineer for these components;
- (f) recording in the post-erection report and provided the engineer with the results of the verification and inspection tasks listed in (a) through (e); and
- (g) a statement that the crane mechanical system complies with the requirements of this Practice Standard, CSA Standard Z248-17, OEM specifications, and local legislation, and there is no outstanding mechanical issue with the tower crane.

(37) Prior to the load test, the engineer shall request and obtain a report provided by the client that provides inspection findings from a qualified technician on the condition of the mechanical components tested under normal operating conditions, including, but not limited to, motors, gears, brakes, sheaves and bearings, and the engineer shall confirm specific reports of occurrences of any of the following:

- (a) abnormal vibration;
- (b) unusual noise or temperature of tower crane components;
- (c) corrosion;
- (d) missing, improperly installed or misaligned components;
- (e) worn or damaged brake linings, brake shoes or brake pads;
- (f) distorted or damaged brake drums, plates, calipers or other components;
- (g) insufficient brake solenoid stroke reserve;
- (h) wire rope improperly spooling onto the drum;
- (i) incorrect sheave size and excessive wear;
- (j) incorrect functioning of floating sheave;
- (k) incorrect functioning of tensioning sheave;
- (l) leaking lubricants;
- (m) wear, play or damage of moving equipment;
- (n) loose or defective bolts or pins;
- (o) missing cotter pins, retaining or locking devices;
- (p) missing, improperly installed or damaged guards on exposed moving parts;
- (q) loose or unsecured materials left on the tower crane; or

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(r) any other hazards not herein listed but deemed important by the engineer.

(38) If, as a result of the inspection described in subsection (37), the engineer finds evidence of any of the occurrences specified in (a) to (r), the engineer shall arrange for further testing, disassembly, inspection or other appropriate action.

(39) The engineer shall request and obtain a report provided by the client from the erector or qualified technician who performed the tests on all brake systems appropriate for the tower crane under review; shall confirm that the results are compliant with the original equipment manufacturer's specifications or with CSA Standard Z248-17; and shall record this information in the post-erection test report. The engineer will provide direction to the erector to correct any items found to be deficient in the report.

(40) The engineer, or person within the engineering firm's organization directed by the engineer, shall witness the load test in accordance with the original equipment manufacturer's specifications or with CSA Standard Z248-17 performed by the erector and shall include the following information in the post-erection report:

- (a) location of the tower crane;
- (b) date the test and subsequent examination was completed;
- (c) weather conditions at time of test;
- (d) the configuration of the tower crane at time of test;
- (e) the serial number or unique identifying mark of the tower crane;
- (f) specifications of main test block/blocks and the kicker test block used and radii tested;
- (g) the load test procedure; and
- (h) details of any defects, unexpected behaviour or abnormal deformation observed during or due to testing.

Post-Erection Inspection Written Report

(41) The engineer shall include the following information in every written tower crane post-erection inspection report required by ss. 158(3) of O. Reg. 213/91:

- (a) name and location of the project;
- (b) make, model and serial number of the tower crane reviewed;
- (c) owner of the tower crane;
- (d) the time period in which the review took place;
- (e) the date on which the report was completed;
- (f) the parties to whom the report is addressed;
- (g) contact information for the engineer who prepared the report;

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- (h) the purpose of the report;
 - (i) specific identification of drawings, blueprints, photographs, documents, manuals and other reference material used;
 - (j) references to legislation, codes, standards or guidelines that have relevance to the work;
 - (k) where judgments or opinions are made, details of the reasoning that led to the report's conclusion or findings;
 - (l) list of defects discovered during review;
 - (m) all reports obtained from qualified NDT technicians, qualified technicians or third parties, including, but not limited to:
 - (i) all engineers involved in the inspection;
 - (ii) electrical inspections identified in subsections (33), (34) and (35);
 - (iii) mechanical and controls inspections identified in subsections (36) and (37); and
 - (iv) tower crane erector inspections described in subsections (25), (26), (39) and (40);
 - (n) the qualifications of all inspection personnel performing the inspections that were provided to the engineer for verification;
 - (o) all directions for repairing damage or incorrect installation that were provided to the tower crane owner;
 - (p) identification of any modifications made to the electrical, mechanical or structural systems of the tower crane, and confirmation that the modifications are documented by either the OEM or by an engineer;
 - (q) installed configuration of the tower crane, results of functionality tests and counterweights installed;
 - (r) identification and contact information for everyone contributing to the report; and
 - (s) a statement that the tower crane is ready to be put into service, including confirmation that all components comply with this Practice Standard, CSA Standard Z248-17 and OEM specifications, are in adequate condition, is ready to put into service with specific limitations, or is not ready to be put into service due to specific deficiencies.
- (42) The engineer shall provide a copy of the report to the client and shall keep a copy for their records.

2.2 Part B: Annual In-Use Inspections

The following are prescribed as the Practice Standard with respect to the annual inspection of an in-use tower crane as provided for in subparagraphs 1iii and 2ii. of ss. 158(1) of O. Reg. 213/91 under the *Occupational Health and Safety Act*, by an engineer or by person(s) directed by the engineer.

Note: This inspection is to be performed on the equipment in the fully assembled, erected operational condition at least once every 12 months or as often as recommended by the tower crane original equipment manufacturer, whichever is more frequent.

Documentation Review

- (1) Before conducting an on-site inspection of an in-use tower crane, the engineer shall:
 - (a) request and obtain from the tower crane owner, operator or client written reconfirmation of the initial installation of the tower crane and drawings (s.157), all available technical information, manuals, tower crane logs (s. 152), previous pre-erection and post-erection reports, records of previous non-destructive testing, original equipment manufacturer's recommendations, maintenance records, previous daily, weekly and monthly inspections performed under section 161.1, operational test results performed under ss. 161(1), parts replacement records and details of any structural repairs, any non-routine maintenance, and all records of modifications for the tower crane to be reviewed that provide information for each major component or subassembly, including, but not limited to the following:
 - (i) tower crane original equipment manufacturer, model and serial numbers;
 - (ii) unique marks for each component;
 - (iii) basic dimensional information to aid identification of components;
 - (iv) height under hook;
 - (v) reeving specifications;
 - (vi) tower height (type and number of sections);
 - (vii) boom length (type and number of sections);
 - (viii) anchor bolt specifications;
 - (ix) counterweight specifications, including arrangement and weight of each counterweight;
 - (x) central base ballast weight specifications, including arrangement and weight of each ballast component, if applicable;
 - (xi) travelling base and track bed, if applicable;
 - (xii) foundation drawings;
 - (xiii) building tie-ins;
 - (xiv) electrical wiring diagram, including control circuits, electronic schematics, transformer specifications, and electric motor specifications;

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- (xv) power supply or generator specifications;
 - (xvi) hydraulic schematics and manuals;
 - (xvii) original equipment manufacturer's or engineer's welding procedure specifications;
 - (xviii) software verification documentation, if available;
 - (xix) documentation of all modifications;
 - (xx) load test criteria; and
 - (xxi) record of the original equipment manufacturer, mark of original equipment manufacturer and technical specifications of the tower crane anchorages, anchor bolts and nuts.
- (b) ensure that the information provided under (a) is sufficiently detailed to enable the engineer to confirm that the specified components have been assembled correctly;
- (c) verify that the components made available for inspection are those identified in the information provided, and verify that the components are the same ones inspected during the initial pre-erection inspection the year prior or added during climbing operations;
- (d) verify that, according to the tower crane log, the tower crane operator has, at a minimum, carried out equipment maintenance according to a pre-existing schedule;
- (e) request and obtain from the tower crane owner, operator or client all wire rope documentation and verify that the ropes conform to the tower crane original equipment manufacturer's specifications or specifications prepared by an engineer;
- (f) request and obtain from the tower crane owner, operator or client all available recall notices and technical bulletins from the original equipment manufacturer of the tower crane being reviewed and verify from the tower crane log book (refer to s.152. (1)) that all recalls and warranty matters for the tower crane have been dealt with; and
- (g) where it is not possible to verify that matters identified in (f) have been dealt with, take whatever steps are necessary to resolve the matter or withdraw services until the necessary information has been provided.

Defects

- (2) Where a previous review report has identified defects requiring rectification, the engineer shall obtain evidence that the necessary remedial action has been taken.
- (3) If there is no evidence or record that defects have been repaired, the engineer shall immediately inform the tower crane owner of the outstanding repairs.
- (4) Upon receiving notice from the owner that repairs have been completed, the engineer must either:
- (a) carry out all inspection(s) or tests needed to verify defects have been corrected; or

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- (b) provide updated instructions to directed personnel for the inspections.

Examinations and Testing

(5) The engineer, or a person directed by the engineer, shall perform a visual examination on the erected tower crane as assembled in the erected configuration. Supplemental non-destructive tests are to be performed as accessible and to further evaluate any items requiring further evaluation as a result of the visual examination. The engineer may perform the NDT inspection if certified to CAN/CGSB 48.9712-2014 or an amended version of this standard that was in effect at the time of certification or direct a qualified NDT technician to perform the inspection including, but not limited to, the following:

- (a) access platforms;
- (b) stairways;
- (c) ladders;
- (d) signs and sign connections;
- (e) tower crane cabin connection;
- (f) boom;
- (g) counter jib;
- (h) tower sections;
- (i) apex;
- (j) pendant;
- (k) travelling base;
- (l) trolley;
- (m) hook block;
- (n) tower fasteners;
- (o) apex fasteners;
- (p) boom fasteners;
- (q) turntable-to-tower fasteners;
- (r) counterweight jib;
- (s) reusable foundation anchor bolts; and
- (t) counterweight suspension points.

(6) The engineer shall determine the type of supplemental non-destructive testing to be done and shall provide this information to the qualified NDT technician carrying out these tests.

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(7) The engineer shall request the client to conduct non-destructive testing or dismantling and inspection of any other tower crane component, if justified on the basis of:

- (a) the content of the previous inspections; or
- (b) the result of the current visual examination.

(8) The engineer, if certified to CAN/CGSB 48.9712-2014 or an amended version of this standard that was in effect at the time of certification shall perform, or direct a qualified NDT technician to perform, the inspections described in subsections (5) and (6). The engineer shall also obtain evidence from the qualified NDT technician that the technician is certified to CAN/CGSB 48.9712-2014 or an amended version of this standard that was in effect at the time of certification.

(9) The engineer shall obtain and review the reports of inspections detailed in subsections (5) and (6), and shall verify that the report includes:

- (a) date and location where the tests were conducted;
- (b) name, qualifications and position of the person conducting the tests;
- (c) description, serial number or identifying mark of the components examined;
- (d) details of the test method employed and reference to appropriate standards;
- (e) calibration details of any test equipment used; and
- (f) results of the examination.

(10) The engineer, or a qualified technician directed by the engineer, shall verify that all pin retainers are in good condition and are properly installed.

Reviews - General

(11) The engineer shall request, obtain and review reports provided by the tower crane owner, client or operator of any electrical, mechanical or structural repairs, modifications or tests done to the tower crane since the last time the tower crane was certified at erection. The engineer shall confirm that the report(s) contain the following:

- (a) the name, qualifications and employing organization of the person completing the inspection and tests;
- (b) results of the inspection, repair, modifications and/or tests;
- (c) documentation relating to any modifications performed by an engineer or the original equipment manufacturer; and
- (d) comparison of the test results with the original equipment manufacturer's specifications.

Review of Electrical components

(12) The engineer shall review, or direct a qualified electrician, master electrician or qualified technician to review, the electrical schematic drawings, visually inspect panels, operator controls,

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power wiring for compliance with the original equipment manufacturer's specifications, local standards, the Electrical Safety Authority SPEC-009 R0, Electrical Safety for Tower Cranes, and to verify that all electrical components are approved by a recognized authority. The engineer shall direct the qualified electrician, master electrician or qualified technician (as the case may be) to provide a report to the engineer in writing that confirms the foregoing.

(13) The engineer shall reaffirm, or direct a qualified electrician, master electrician or qualified technician to reaffirm, the grounding continuity test for both the tower crane and power supply grounding systems in accordance with the Electrical Safety Code; and the engineer shall direct the qualified electrician, master electrician or qualified technician (as the case may be) to provide a report which the engineer will confirm as containing the following:

- (a) the name, qualifications and employing organization of the person completing the test;
- (b) results of the test;
- (c) comparison of the test results with standard requirements;
- (d) identification and calibration details of the test equipment used; and
- (e) the date the test was completed.

(14) The engineer shall perform the following functions, or direct a qualified electrician, master electrician or qualified technician, to:

- (a) verify the demarcation point with the local power authority or general contractor;
- (b) visually inspect the entire electrical system from the demarcation point or generator to the electrical components on the tower crane, looking for damage or violations of the Electrical Safety Code and compliance with original equipment manufacturer's specifications;
- (c) power up the electrical system and check all operating electrical components for vibration and excessive heat, and verify that the components are functioning as intended;
- (d) verify that the electrical equipment and components are appropriate for the environment in which it will be operating;
- (e) verify that each in-use limit switch, overload limit device, and any other limiting device specified by the original equipment manufacturer, is properly located, set and operating as intended;
- (f) verify that emergency stops function as intended;
- (g) verify that the tower crane structure is grounded separately from the power system via grounding rods, plates or other means of distributing charge to the earth;
- (h) verify, if power is supplied by a generator, that the generator is separately grounded in accordance with the Electrical Safety Code and original equipment manufacturer's instructions; and

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- (i) record in the post-erection report the results of the verification and inspection tasks listed in (a) through (h).

Review of Mechanical Components

(15) The engineer shall inspect, or direct a qualified technician to inspect, the rotational bearing or slew ring and:

- (a) obtain the serial number or unique identifying mark of the slew ring;
- (b) observe the condition of the gear teeth on bearing and pinion;
- (c) observe the condition of the slew ring greasing systems including the condition of the grease, grease lines, nipples and lip seals;
- (d) verify torquing of the rotational bearing bolts is done according to the original equipment manufacturer's specifications; and
- (e) verify that bolts needing replacement as a result of the inspection comply with the original equipment manufacturer's specifications or engineer's direction.

(16) The engineer shall inspect, or direct a qualified technician to inspect, the brake system, gearbox, hook block, the hydraulic system (including pumps and motors), and report to the engineer any improper or inadequate connections, corroded elements, leaks, hose wear and other deficiencies.

(17) The engineer shall perform the following functions, or direct a qualified technician, to:

- (a) confirm that all control levers operate the appropriate function, move smoothly, return to neutral position when released, and are properly identified;
- (b) verify that calibration of the load moment system (load indicator, angle indicator, height indicator, radius indicator) has been completed;
- (c) check the functioning, integrity and condition of limit switches and operator's controls;
- (d) visually check control wiring and report damage or improper installation;
- (e) visually check the condition of electronic components;
- (f) witness functional tests for all control components at the extreme limits of use, as described by the original equipment manufacturer or in the most unfavourable position determined by the engineer for these components; and
- (g) prepare an inspection report for the engineer of the results of the verification and inspection tasks listed in (a) through (f).

(18) The engineer shall inspect, or direct a qualified technician to inspect, the condition of the mechanical equipment tested under normal operating conditions, including, but not limited to, motors, gears, brakes, sheaves and bearings; and shall specifically report to the engineer occurrences of any of the following:

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- (a) abnormal vibration;
- (b) unusual noise or temperature of tower crane components;
- (c) corrosion;
- (d) missing, improperly installed or misaligned components;
- (e) worn or damaged brake linings, brake shoes or brake pads;
- (f) distorted or damaged brake drums, plates, calipers or other components;
- (g) insufficient brake solenoid stroke reserve;
- (h) wire rope improperly spooling onto the drum;
- (i) incorrect sheave size and excessive wear;
- (j) incorrect functioning of floating sheave;
- (k) incorrect functioning of tensioning sheave;
- (l) leaking lubricants or incorrect type of lubricants;
- (m) wear, play or damage of moving equipment;
- (n) loose or defective bolts or pins;
- (o) missing cotter pins, retaining or locking devices;
- (p) missing, improperly installed or damaged guards on exposed moving parts;
- (q) loose or unsecured materials left on the tower crane; or
- (r) any other hazards not herein listed but deemed important by the review engineer.

(19) If, as a result of the inspection described in subsection (18), the engineer finds evidence of any of the occurrences specified in (a) to (r), the engineer shall specify further testing, disassembly, inspection, or other appropriate action.

(20) The engineer shall verify that the persons performing the inspections in subsections (12) through (18) are qualified to perform the inspections and obtain copies of the person's credentials including the name, qualifications and employing organization of the person completing the inspection and tests.

Annual Inspection Written Report

(21) The engineer shall include the following information in every annual tower crane inspection report required by subsection 158(3) of O. Reg. 213/91:

- (a) name and location of the project;
- (b) make and model of the tower crane reviewed;
- (c) owner of the tower crane;

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- (d) the time period in which the review took place;
 - (e) the date on which the report was completed;
 - (f) the parties to whom the report is addressed;
 - (g) contact information for the engineer who prepared the report;
 - (h) the purpose of the report;
 - (i) specific identification of drawings, blueprints, photographs, documents, manuals and other reference material used;
 - (j) references to legislation, codes, standards or guidelines that have relevance to the work;
 - (k) where judgments or opinions are made, details of the reasoning that led to the report's conclusion or findings;
 - (l) record of observations made in subsections (13) through (19) including the name, qualifications and employing organization of the person completing the inspection and tests;
 - (m) results of the visual and supplemental non-destructive inspection, including the name, qualifications and employing organization of the person completing the inspection and tests;
 - (n) all directions for repairing damage or incorrect installation that were provided to the tower crane owner:
 - (o) Identification of any modifications made to the electrical, mechanical or structural systems of the tower crane; and that the modifications are documented by either the OEM or by an engineer:
 - (p) identification and contact information for everyone contributing to the report; and
 - (q) a statement that the tower crane complies with the requirements of this Practice Standard, CSA Standard Z248-17 and OEM specifications; and the tower crane is ready to be put into service including confirmation that all components are in adequate condition, is ready to put into service with specific limitations, or is not ready to be put into service due to specific deficiencies.
- (22) The engineer report shall immediately notify the tower crane owner in writing of any defects found during the inspection of the tower crane.
- (23) The engineer shall verify that all defects have been corrected.

2.3 Part C: Inspection of Climbing Systems

Note: While outside of the scope of this Practice Standard, the engineer shall ensure that other requirements in relation to climbing operation in O. Reg. 213/91 are met. The regulation mandates the minimum requirements for shoring and bracing, building or structure that supports tower crane, inspection of tie-ins, shoring and bracing, confirmation report that the that shoring, bracing and tie-ins are installed in accordance with the drawings, instruction for additional inspection, and inspection frequency of the shoring, bracing and tie-ins after each climbing operation. For reference, these requirements are listed in subsections 157(2), (4), (10), (11), (12) and (13) of O. Reg. 213/91.

The following are prescribed as the Practice Standard with respect to inspection of a tower crane's climbing system as provided for in s.159 of O. Reg. 213/91 under the *Occupational Health and Safety Act* by an engineer, or by person(s) directed by the engineer. A climbing system must be inspected:

- (a) prior to the initial climbing operation of the tower crane at the project; and
- (b) thereafter at intervals not greater than 12 months while the tower crane is erected at a project.

Note: The inspection of a climbing system is to be performed in addition to the requirements of Parts A and B, and **prior to each use** of the climbing system [as also required on clause 159 (1)(b) for climbing system as per CSA Standard Z248-17, section 5.9.8.8 "Climbing section"]. The expectation of inspection **prior to each use** is a higher inspection frequency than those described in annual inspections of Parts A and B above. As such, the requirement for inspection prior to each use may require these components to be inspected more frequently than the annual interval.

(1) The engineer shall conduct, or direct a qualified NDT technician to conduct, a visual examination and non-destructive test on areas of concern or representative samples based on visual examination of the climbing system prior to the erection and initial climbing operation of the tower crane at the project.

(2) The engineer shall direct a qualified technician to inspect the hydraulic system, including pumps and motors, and report any improper or inadequate connections, corroded elements, leaks, hose wear and other deficiencies; and the qualified technician shall provide a written report to the engineer.

(3) The engineer shall verify that the climbing system used is the one specified by the OEM and shall verify that the erector has installed the climber with the parts specified by the original equipment manufacturer or approved by an engineer.

Climbing System Inspection Written Report

(4) Under the requirements, of ss.159(2) of O. Reg. 213/91, the engineer, in accordance with subsections (1) through (3), shall prepare a written report for the tower crane owner that contains the results of all inspections and provides a statement that the climbing components comply with the requirements of this Practice Standard, is ready to be put into service, including confirmation

that all components are in adequate condition, is ready to put into service with specific limitations, or is not ready to be put into service due to specific deficiencies.

2.4 Part D: Inspection of Self-Erecting Tower Cranes

The following are prescribed as the Practice Standard with respect to inspection of a self-erecting tower crane as provided for in subparagraph 2 of ss. 158(1) of O. Reg. 213/91 under the *Occupational Health and Safety Act* by an engineer, or by person(s) directed by the engineer.

For self-erecting tower cranes, inspections must be conducted:

- before the tower crane is put into service for the first time;
- at least once every 12 months while the tower crane is in use at a project; and
- after every 12 erections of the tower crane, or as often as is recommended by the tower crane original equipment manufacturer, whichever occurs first. (**Note:** this is addressed in Part B)

Documentation Review

(1) Before conducting an on-site inspection of a self-erecting tower crane, the engineer shall:

(a) request and obtain from the tower crane owner, client or operator all available technical information, manuals, tower crane logs (s. 152), previous engineer certification reports, records of previous non-destructive testing, maintenance records, previous daily, weekly and monthly inspections performed under s. 161.1, operational test results performed under ss. 161(1), parts replacement records and details of any structural repairs and any non-routine maintenance, and all records of modifications for the self-erecting tower crane to be reviewed that provides information for each major component or sub assembly, including, but not limited to, the following:

- (i) tower crane original equipment manufacturer, model and serial numbers;
- (ii) unique marks for each component;
- (iii) load block and reeving specifications;
- (iv) counterweight specifications, including arrangement and weight of each counterweight;
- (v) central base ballast weight specifications, including arrangement and weight of each ballast component, if applicable;
- (vi) hydraulic schematics and manuals;
- (vii) original equipment manufacturer's or engineer's welding procedure specifications;
- (viii) software verification documentation, if available;
- (ix) documentation of all modifications;
- (x) load test criteria; and
- (xi) turn table specifications, inclusive of bolts and installation torque requirements.

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- (b) ensure that the information provided under (a) is sufficiently detailed to enable the engineer to confirm that the specified components have been assembled correctly;
- (c) verify that the components made available for inspection are those identified in the information provided in (a);
- (d) verify that, according to the tower crane log, the tower crane operator has, at a minimum, carried out equipment maintenance according to a pre-existing schedule;
- (e) request and obtain from the tower crane owner, client or operator all wire rope documentation, and verify that the ropes conform to the tower crane original equipment manufacturer's specifications or specifications prepared by an engineer; and
- (f) request and obtain from the tower crane owner, client or operator all recall notices and technical bulletins from the original equipment manufacturer of the tower crane being reviewed and verify from the tower crane log book (refer to ss.152. (1)) that all recalls and warranty matters for the tower crane have been dealt with.

Defects

- (2) Where a previous inspection report has identified defects requiring rectification, the engineer shall obtain evidence that the necessary remedial action has been taken before an inspection is completed.
- (3) If there is no evidence or record that defects have been repaired, the engineer shall immediately inform the tower crane owner of the outstanding repairs.
- (4) Upon receiving notice from the tower crane owner that repairs have been completed, the engineer must either:
 - (a) carry out all inspection(s) or tests needed to verify defects have been corrected; or
 - (b) provide updated instructions to directed personnel for the inspections.

Examinations and Testing

- (5) The engineer shall determine the type of visual or non-destructive testing to be done and shall provide this information to the qualified NDT technician or firm carrying out these tests.
- (6) The engineer shall perform, if certified to CAN/CGSB 48.9712-2014 or an amended version of this standard that was in effect at the time of certification, or direct a qualified NDT technician to perform, a visual examination and non-destructive test of all accessible areas of each of the following components:
 - a) outrigger beams and support pads;
 - b) carrier frame or assembly;
 - c) boom pins;
 - d) bridle pins;
 - e) pendant pins;

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- f) slew ring fasteners;
- g) counterweight connection;
- h) tower sections;
- i) boom/jib;
- j) gantry /live mast;
- k) counterweight suspension points;
- l) pendant lines or bars;
- m) trolley;
- n) hook block;
- o) load line;
- p) access platforms;
- q) signs and sign connections, and
- r) tower crane cabin connection.

(7) The engineer shall request the tower crane owner, client or operator to conduct additional visual or non-destructive testing, dismantling and inspection of any other tower crane component, if justified on the basis of:

- (a) the content of the previous reviews; or
- (b) the result of the current NDT examination.

(8) The engineer shall require the technician who carries out the tests described in subsection (5) to provide evidence of certification to CAN/CGSB 48.9712-2014 or an amended version of this standard that was in effect at the time of certification.

(9) The engineer shall request and obtain the reports of non-destructive testing detailed in subsection (6) and shall confirm that the report includes:

- (a) date and location where the tests were conducted;
- (b) name, qualifications and position of the person conducting the tests;
- (c) description, serial number or identifying mark of the components examined;
- (d) details of the test method employed and reference to appropriate standards;
- (e) calibration details of any test equipment used; and
- (f) itemized results of the examination.

(10) The engineer, or qualified NDT technician directed by the engineer, shall verify that all pin retainers are in good condition and properly installed.

(11) In assessing the slew ring, the engineer shall:

- (a) obtain the serial number or unique identifying mark of the slew ring;
- (b) observe the condition of the gear teeth on bearing and pinion, or alternatively, review the report of a qualified NDT technician or a qualified technician;

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(c) observe the condition of the slew ring greasing systems, including the condition of the grease, grease lines, nipples and lip seals, or alternatively, review the report of a qualified NDT technician or a qualified technician; and

(d) verify torquing of bolts by a qualified technician has been done according to the original equipment manufacturer's specifications.

(12) The engineer shall request and obtain from the tower crane owner, client or operator a report prepared by a qualified technician that details the inspection of the hydraulic system, including pumps and motors, and that reports any improper or inadequate connections, corroded elements, leaks, hose wear and other deficiencies.

Defect Correction

(13) The engineer shall immediately notify the tower crane owner in writing of any defects found during the inspection of the tower crane.

(14) The engineer shall verify that all defects are corrected before the tower crane is returned to service.

Inspections – Mechanical Components

(15) The engineer, or qualified NDT technician directed by the engineer, shall inspect wire ropes and end connections as per CSA Standard Z248-17.

(16) The engineer shall ensure that the swivel and/or end terminations on any rope is installed in accordance with the tower crane original equipment manufacturer's specifications.

(17) The engineer shall request and obtain from the tower crane owner, client or operator a report prepared by a qualified technician, and the engineer shall confirm that the report:

(a) provided the qualification of all inspection personnel performing these inspections to the engineer for verification;

(b) verified that calibration of the load moment system (load indicator, angle indicator, height indicator, radius indicator) has been completed;

(c) checked the functioning, integrity and condition of limit switches and operator's controls;

(d) visually checked the control wiring and report damage or improper installation;

(e) visually checked the condition of electronic components;

(f) witnessed the functional tests for all control components at the extreme limits of use, as described by the original equipment manufacturer, or in the most unfavourable position determined by the engineer for these components;

(g) recorded in the inspection report and provide the engineer the results of the verification and inspection tasks listed in (a) through (f); and

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(h) confirmed that all control levers operate the appropriate function, move smoothly, return to neutral position when released, and are properly identified.

(18) The engineer shall request and obtain a report from a qualified technician on the condition of the mechanical components tested under normal operating conditions, including, but not limited to, motors, gears, brakes, sheaves and bearings; and the engineer shall confirm if this report specifically reported occurrences of any of the following:

- (a) abnormal vibration;
- (b) unusual noise or temperature of tower crane components;
- (c) corrosion;
- (d) missing, improperly installed or misaligned components;
- (e) worn or damaged brake linings, brake shoes or brake pads;
- (f) distorted or damaged brake drums, plates, calipers or other components;
- (g) insufficient brake solenoid stroke reserve;
- (h) wire rope improperly spooling onto the drum;
- (i) incorrect sheave size and excessive wear;
- (j) incorrect functioning of floating sheave;
- (k) incorrect functioning of tensioning sheave;
- (l) leaking lubricants;
- (m) wear, play or damage of moving equipment;
- (n) loose or defective bolts or pins;
- (o) missing cotter pins, retaining or locking devices;
- (p) missing, improperly installed or damaged guards on exposed moving parts; or
- (q) loose or unsecured materials left on the tower crane.

(19) If, as a result of the inspection described in subsection (18), the engineer finds evidence of any of the occurrences specified in (a) to (q), the engineer shall arrange for further testing, disassembly, inspection, or other appropriate action.

Self-Erecting Tower Crane Inspection Written Report

(20) The engineer shall prepare a written self-erecting tower crane inspection report as required by subsection 158(3) of O. Reg 213/91 and include the following information:

- (a) name and location of the project;
- (b) make and model of the tower crane reviewed;

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- (c) owner of the tower crane;
 - (d) the time period in which the review took place;
 - (e) the date on which the report was completed;
 - (f) the parties to whom the report is addressed;
 - (g) contact information for the engineer who prepared the report;
 - (h) the purpose of the report;
 - (i) specific identification of drawings, blueprints, photographs, documents, manuals and other reference material used;
 - (j) references to legislation, codes, standards or guidelines that have relevance to the work;
 - (k) where judgments or opinions are made, details of the reasoning that led to the report's conclusion or findings;
 - (l) list of defects discovered during review;
 - (m) all reports obtained from qualified NDT technicians, qualified technicians or third parties, including:
 - (i) record of observations made by all involved personnel in subsections (9), (10) and (11) and;
 - (ii) the non-destructive testing report described in subsection (8), including the name, qualifications and employing organization of the person(s) completing the inspection and tests.
 - (n) all directions for repairing damage or incorrect installation that were provided to the tower crane owner;
 - (o) identification and contact information for everyone contributing to the report; and
 - (p) a statement that the tower crane is ready to be put into service including confirmation that all components comply with the requirements of this Practice Standard, CSA Standard Z248-17, and OEM specifications, are in adequate condition, is ready to put into service with specific limitations, or is not ready to be put into service due to specific deficiencies.
- (21) The engineer shall provide a copy of the report to the tower crane owner and shall keep a copy for their records.

2.5 Part E: Inspection of the track foundation and track (of a tower crane mounted on a travelling base)

The following is prescribed as the Practice Standard with respect to an inspection by an engineer of the track foundation and track of a tower crane mounted on a travelling base, as provided for in subsection 165(3) of Ontario Regulation 213/91 under the *Occupational Health and Safety Act*:

Note: When a tower crane is mounted on a travelling base foundation system rather than a fixed foundation, there are additional inspection requirements beyond those detailed in Parts A and B above. The engineer shall inspect the track foundation and track at time of installation at the construction site and then at each 12-month interval to follow in accordance with subsection 165(3) of O. Reg. 213/91.

(1) The engineer shall perform the inspection to verify that the foundation, rails bed and rails have been installed in accordance with the original equipment manufacturer's specifications or installation drawings provided by an engineer.

(2) The engineer, if certified to CAN/CGSB 48.9712-2014 or an amended version of this standard that was in effect at the time of certification, shall perform, or instruct a qualified NDT technician to perform, a visual examination and non-destructive testing of all accessible areas of each of the following components as accessible:

- (a) wheel trucks and wheels/bogies;
- (b) wheel axles and wheel truck connection pins;
- (c) knee braces and connection pins;
- (d) travelling base section and bolted or pinned connection;
- (e) track rails; and
- (f) track rail splice connections.

(3) The engineer shall inspect or supervise the inspection of the electrical drive motor, and wheel truck braking systems of the travelling base.

(4) The engineer shall include the inspection findings in the Part A pre-erection inspection report and/or Part B post-erection inspection report detailed in this Practice Standard.